

WHAT IS CLAIMED IS:

1. A transmitting apparatus which constructs a ring network capable of transmitting in first and second directions via first and second transmission lines

5 respectively, said transmitting apparatus cross connecting and transmitting main signals on respective channels, which enter via one of the first and second transmission lines to which working and protection channels have been assigned, and rescuing a main signal
10 when a transmission line fails by looping back the main signal in the opposite direction using the protection channel of another transmission line, said apparatus comprising:

an unrescuable failure discrimination unit for
15 determining whether failure for which rescue is impossible has occurred in each channel of a second group, wherein channels that are the object of rescue by loop-back are classified to a first group of channels which are set so as not to be rescued by loop-back and a
20 second group of channels other than the first group of channels and a channel of the first group is referred to as a non-rescue channel;

non-rescue information storage means for storing non-rescue information which indicates whether a channel
25 that is the object of rescue by loop-back is a non-rescue channel; and

discrimination-result insertion means which, on the basis of main-signal cross-connect information,

interchanges a result of discrimination of each channel of the second group and inserts the interchanged result of discrimination in the main signal of the corresponding channel after cross connect.

- 5 2. The apparatus according to claim 1, further comprising:

ring-type storage means for storing ring type which specifies transmission rate of ring network to which the transmitting apparatus is connected; and

- 10 a channel decision unit for deciding, on the basis of the ring-type information and non-rescue information, whether each channel that is the object of rescue is the channel of the second group;

- 15 wherein said non-rescue information storage means has a storage area for storing, on a per-ring-type basis, non-rescue information which specifies whether a channel that is the object of rescue is a non-rescue channel; and

- 20 said channel decision unit makes the decision based upon the non-rescue information of the ring type stored in the ring-type storage means.

3. The apparatus according to claim 2, wherein said non-rescue information storage means stores the non-rescue information only for working channels in a
25 prescribed direction among the channels that are the object of rescue;

said channel decision unit decides channels of the second group from among the working channels of said

direction;

said unrescuable failure discrimination unit determines whether an unrescuable failure has occurred in the channel of the second group; and

5 on the basis of main-signal cross-connect information, said discrimination-result insertion means interchanges the result of discrimination of the channels of the second group and inserts the interchanged result of discrimination in the main signal
10 of the corresponding channel after cross connect, this insertion being performed in the working channels and protection channels of the first and second directions.

4. The apparatus according to claim 1, wherein the channels are STS channels in a synchronous optical
15 network;

said unrescuable failure discrimination unit determines whether failure for which rescue by loop-back is impossible has occurred in each virtual tributary channel (VT channel) accommodated by an STS channel of
20 the second group; and

on the basis of main-signal STS cross-connect information, said discrimination-result insertion means interchanges a result of discrimination of said each VT channel on a per-STS-channel basis and inserts the
25 interchanged result of discrimination in the corresponding VT signal after STS cross connect.

5. The apparatus according to claim 1, further comprising:

activate processing means for receiving the discrimination result before it is interchanged based upon the cross-connect information, monitoring whether an unrescuable failure has continued in excess of a
5 predetermined period of time for every channel, and monitoring whether a recovery from failure has been accomplished; and

interchanging means for interchanging and outputting result of monitoring on the basis of main-
10 signal cross-connect information.

6. The apparatus according to claim 5, wherein the channels are STS channels in a synchronous optical network;

said unrescuable failure discrimination unit
15 determines whether failure for which rescue by loop-back is impossible has occurred in each virtual tributary channel (VT channel) accommodated by an STS channel of the second group;

said activate processing means monitors whether an
20 unrescuable failure has continued in excess of a predetermined period of time for every VT channel and monitors whether a recovery from failure has been accomplished for every TV channel; and

said interchanging means interchanges and outputs
25 result of monitoring of every VT channel on a per-STS-channel basis on the basis of main-signal cross-connect information.

7. The apparatus according to claim 4, further

comprising:

5 a VT path protection switch having, for every VT channel, a service selector switch function which, when a failure has occurred in a first transmission path of first and second transmission paths connecting two ring networks, performs rescue by selecting a signal that enters from the second transmission path; and

10 a service selector information generator for generating service selector information which specifies that the VT path protection switch is to operate as service selector switch;

15 wherein on the basis of main-signal cross-connect information, said service selector information generator interchanges information indicating whether a channel that is the object of rescue is the channel of the second group, generates service selector information for every VT channel by this interchange, and delivers the service selector information to said VT path protection switch.

20 8. The apparatus according to claim 7, wherein on the basis of main-signal STS cross-connect information, said service selector information generator interchanges information indicating whether a channel that is the object of rescue in STS working channel of a prescribed direction is the channel of the second group, and
25 interchanges this interchanged information concerning the channel of the second group on the basis of main-signal VT cross-connect information, thereby generating

service selector information for every VT channel.

9. A transmitting apparatus having an STS switch for cross connecting an STS signal which accommodates a plurality of virtual tributary signals (VT signals), and
5 two VT switches to which an STS signal, which has been cross connected by the STS switch, is input upon being split into respective halves, wherein said VT switches replace VT pointers contained in the STS signal, VT-channel signals following the replacement of the VT
10 pointers are passed between said VT switches and the VT signals are then cross connected, said apparatus comprising:

timing adjustment unit for adjusting multiframe timing;

15 a VT pointer replacement unit for replacing VT pointers using as a reference the multiframe timing that has been adjusted;

means for passing VT-channel signals between said VT switches after replacement of the VT pointers; and

20 a VT line switching unit for cross connecting the VT channel signals;

10. The apparatus according to claim 9, wherein said timing adjustment unit, which is provided in one of said VT switches (a master switch), has (1) a multiframe
25 timing generator for generating a multiframe timing pulse from a frame timing pulse, and (2) a timing pulse generator for generating a reference multiframe timing pulse of a prescribed width indicating a position one-

half frame ahead of the multiframe timing; and

said timing adjustment unit, which is provided in the other of said VT switches (a slave switch), has (1) a judgment circuit for sampling reference multiframe

5 timing pulses at high speed and, if a sampled value of a pulse has the same level a plurality of times in succession, judging that the pulse is a true reference multiframe timing pulse, and (2) a multiframe timing generator for adopting, as a multiframe timing pulse, a frame timing pulse of the slave switch generated the first timing following detection of said reference multiframe timing pulse.